REMARKS

CLAIM OBJECTIONS

Claim 2 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim.

Claim 2 is cancelled for redundancy in that claim 1 has been amended to include the limitation of claim 2.

CLAIM REJECTION UNDER 35 USC §103

Method claims 1, 3 – 6 and 8 remain, claim 2 having been cancelled.

Method claims 1 – 6 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicants' admitted prior art (see specification pages 1 – 4 and Figures 1 – 3), hereinafter AAPA, in view of Roberts et al., U.S. Patent 3,859,135, and Chen et al., U.S. Patent Application 2002/0124388.

Claim 1 had previously been amended to limit the method of the invention for cutting pasted expanded, punched or cast "continuous" metal mesh strip into "paperless" battery plates for lead acid batteries with a cutting device comprising heating the cutting device to a temperature of "at least about 150°C" to preclude adherence of paste to the cutting device.

Applicants' prior art process illustrated in Figures 1 – 3 of the present application comprises cutting expanded continuous metal mesh strip which has been continuously saturated and coated on each side with paste and covered on each outside surface with a paper barrier. Applicants and the battery industry world-wide for the past 28 years of manufacture of battery plates from continuous pasted mesh strip typically have applied and continue to apply a lower paper barrier to the underside of continuous expanded metal mesh strip before saturation with paste from a paste hopper and then covered the pasted strip with an upper paper barrier. The paper barriers heretofore have been necessary to obviate sticking of the freshly-applied paste to the plate cutter dies and anvil roll. As pointed out on to page 2, lines 6 - 17 of this application, many attempts have been made by manufacturers, suppliers and the battery industry in general since the mid-1970s to eliminate the need for paper barriers because of cost considerations and numerous production problems without success.

Although Applicants and manufacturers, suppliers and the industry in general are persons skilled in the art, it took many years of research to develop a process for cutting continuous pasted metal mesh strip which could be accomplished without the presence of paper barriers. No one in the art of manufacture of battery plates from continuous metal mesh strip heretofore could avoid the need for paper barriers.

Roberts et al. disclose a method for the manufacture of battery plates in which discrete plates travelling on a conveyor are pasted by application of a strip of paste extruded onto the plates and the paste extrusion is cut into lengths by a rotary cutter 41 having a pair of cutting wires 43 (col. 8, lines 44 – 58). Paste apparently did not stick to the paste cutting tool and paste adhesion was not a problem. The Roberts et al. method by its very nature does not necessitate cutting of pasted plates and paper coverings accordingly were not required.

Roberts et al. disclose a heated support bar under a sonotrode providing ultrasonic energy to cause paste to flow into the interstices of a plate grid. The heated support bar prevents sticking of excess paste to the surface of the support bar. Roberts et al. do not teach or suggest heating of a cutting device for severing pasted continuous metal mesh strip into lengths by penetrating the thickness of metal mesh strip fully saturated with paste extending from one mesh surface to the opposite mesh surface. There is no motivation or suggestion in Roberts et al. to heat a cutting device for elimination of paper from a continuous pasted battery plate production process. The cutting device in Roberts et al. for severing the paste extrusion is in fact not heated.

Roberts et al. disclose a range of 120 to 300°C, which includes the range of 120 to 150°C which applicants have found to be inoperative. Applicants found that the minimum die temperature required to prevent sticking of battery paste to the cutting dies must be above about 150° and below the melting point of the lead alloy of the battery plates, preferably 160 to 300°C, and more preferably 180 to 210°C. Die temperatures below 150° were not effective due to battery paste sticking to the die surfaces (page 6, line 26 to page 7, line 8, particularly page 7, lines 1 and 2). Claim 1 is now limited to a temperature of at least about 150°C, claims 3 and 5 are limited to a temperature range of about 160 to 300°C and claim 6 is limited to a temperature range of about 180 to 210°C.

Chen et al. disclose the use of paperless battery plates pasted with a paste containing water and polymers to bind inorganic crystals together to form a paste mixture having rheological properties (par. 0020, lines 9 - 12). To prevent sticking of the plates and to promote cohesion and adhesion of the active material to the grid surface, the pasted plates are dried, during which water is flash vaporized and polymerisation occurs. The plates can then be cut without the use of pasting papers since the paste is no longer sticky and would not adhere to the cutting apparatus. Furthermore, pasting papers allegedly are not required because the pasted plates are not piled on skids (par. 0030, lines 7 and 8). This patent then acknowledges that the absence of pasting papers enhances battery performance in that "...pasting papers are not necessary, which will benefit initial electrical performance of the batteries." (par. 0030, lines 7 – 9).

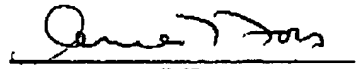
Chen et al. teach that it is beneficial not to have pasting papers but do not teach or suggest how to continuously cut battery plates from continuous strip pasted with a fresh, sticky conventional paste. Applicants are able to continuously paste with a fresh, sticky conventional paste and sever freshly pasted strip to produce battery plates of desired configuration on an assembly line operating at commercial speeds without the need for a polymer binder which then passes through a drying step in which water is vaporized and in which polymerization occurs in the paste (par. 0030, lines 4 – 6). The addition of polymer (Figure 2 of Chen et al.) not only requires an additional process step for introducing the polymer but also necessitates a step for polymerisation of the polymer and vaporization of water which renders the Chen et al. product frangible and the paste diluted relative to applicants' product.

Applicants claim in amended claim 1 a new process not suggested by AAPA, by Roberts et al. and Chen et al. collectively in a combination of their teachings for a *prima facie* case of obviousness, particularly in view of the 28 years of longfelt need by the Applicants and by the industry in general for a process to obviate the presence of paper barriers in the continuous production of paperless battery plates from pasted continuous metal mesh strip wherein the process necessitates penetrating a thickness of metal mesh freshly saturated with paste extending from one side of the mesh to the other side of the mesh.

With respect to claim 5, and remaining dependent claims 3, 4 and 6 – 8, in that it is believed claim 1 is patentable over the cited art as discussed above, it is submitted that these claims dependent thereon are patentable thereover.

It is therefore respectfully submitted that claims 1, 3 – 6 and 8 are patentable over the combination of cited references. Favourable consideration of the application and allowance of claims 1, 3 – 6 and 8 accordingly are earnestly solicited.

Respectfully submitted,
Marlow, et al.



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